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THE NEW ENGLAND BOTANICAL CLUB

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REDISCOVERY OF THE GENUS NEOPARRYA MATHIAS (UMBELLIFERAE)

WILLIAM A. WEBER[1]

Neoparrya Mathias[2] is a monotypic genus of Umbelliferae endemic in the southern Rocky Mountains. *N. lithophila* was described from a single collection of Parry from his 1867 expedition for the Pacific Railroads (Palmer 1869). Paradoxically, the species was never again found in nature until the spring of 1957, when the writer, having reconstructed Parry's itinerary from his diaries (Parry 1867), succeeded in discovering the actual type locality. This locality, given on the original label as "New Mexico. On rocks, Huefano Mts, Sept., 1867, *C. C. Parry* 83", is to be found in Colorado, rather than New Mexico as generally supposed.

The morphological affinities of *Neoparrya* are quite obviously with *Aletes*, a small genus of three species limited also to the southern Rocky Mountains. *A. humilis* is a very restricted endemic found at only one station, along Dale Creek in Larimer County in north-central Colorado; *A. macdougalii* occurs on talus slopes of the Colorado Plateaus Province in the Four Corners region; and the most widespread species, *A. acaulis*, occupies a narrow zone along the eastern base of the Rocky Mountains from northern Colorado south into New Mexico, West Texas, and northern Mexico.

Both *Aletes* and *Neoparrya* are strongly xeromorphic, with thick, glossy, leathery-textured leaves with a basic pinnate form but with the leaflets tending to be ternately divided. The leaves arise basally from numerous caudices, forming mats of several

[1] University of Colorado Museum, Boulder.

[2] *Neoparrya lithophila* Mathias in Ann. Mo. Bot. Gard. **16**: 393. 1929.

decimeters diameter. The flowers are yellow in *Aletes* (in *Neoparrya* they were unknown) and the rays of the umbel in both genera tend to be reflexed at maturity. The only feature by which *Neoparrya* seems to differ markedly from *Aletes* is in the oil-tubes which are of various sizes and are scattered through the pericarp instead of lying in a uniform row. The ecological preference of *Aletes* is rock ledges and cliffs, usually at altitudes of from 6,000 to 8,000 feet, where it forms conspicuous mats on the canyon sides. In anthesis the masses of yellow umbels are quite showy.

Aletes acaulis is an abundant and conspicuous species in the canyons of the east face of the Front Range in Colorado and New Mexico, and *Neoparrya* is similar enough in its general appearance, judging from the herbarium material, to indicate similar ecological preferences. Nevertheless the plant has eluded collectors for nearly a hundred years although it must, according to Parry's route, occur in a region rather extensively botanized. Dr. Mathias, who described the species in 1929, had hunted it unsuccessfully for many seasons in what she felt must be the type region.

Although the writer was unaware of the following quotation until after *Neoparrya* was rediscovered, it is interesting to find that Standley (1910) suspected that Parry's New Mexico localities of 1867 were incorrectly interpreted, for he says (concerning the type locality of *Artemisia Parryi* Gray): " 'Huefano Mts., New Mexico, Dr. C. C. Parry in September 1867'. This must have been collected in Colorado, for there is a range of this name in that state and none, so far as the writer knows, in New Mexico. The name should certainly read Huerfano instead of Huefano."

That Dr. Mathias had independently come to the same conclusion is apparent from her letters to the writer (1956):

"At the time I published the genus, away back in 1929, I had a number of sheets, since the original collection by Dr. Parry was a large one and widely distributed; and from the information on these sheets and from other notes which I was able to get and which I no longer have, I indicated that it was apparently collected on Huerfano Peak near Servilleta in Taos County. I have looked in that area and, so far, without any success. However, it is highly possible that it was collected in the canyon of

the Rio Grande, which is a little inaccessible in that area, as you know. . . I have been on the plateau in New Mexico on both sides of the Rio Grande and I have also looked through large areas of the canyon of the Rio Grande and tributary canyons where I could get into them. The fruiting specimens were collected in September so that I do not believe I have been too late. I have gone into this area, now, in every month from June through late September without success. However, some of the perennial Umbelliferae manage to survive without maturing fruit over long periods of time and I may have been unfortunate in never hitting the area in a good year. It is one of those curious plants which I am certain will turn up sooner or later, and anything you can do in the way of looking will certainly be appreciated by us."

During this long search, Dr. Mathias' suspicion grew that the type locality was incorrectly understood.

"I had thought originally that it must have been collected in the Rio Grande Canyon, not far from Santa Fe or Taos, New Mexico. However, last summer when I was at the Missouri Botanical Garden library, I pulled out a number of the old reports on this expedition and it seems to me that it is just as likely that this plant may have been collected at the headwaters of Huerfano Creek somewhere in the neighborhood of La Veta Pass in southern Colorado. If so, it would be on the talus slopes, I suspect. I did look over the little Huerfano Peak near Walsenburg with a fine-toothed comb last summer, and I am certain it is not there. It probably was farther up the headwaters of the creek. This is a genus which you might watch for when you are in the southern part of the State. I would certainly be delighted to find it again."

In a study of the genus *Helianthella* (Weber, 1952), the writer had a similar experience in settling the type locality of *Helianthella parryi* Gray, and found evidence indicating that any plants which Parry collected in the 'Huefano Mts.' in 1867, were actually collected in Colorado rather than New Mexico, on the headwaters of Huerfano Creek.

Fortunately, several published documents concerning the 1867 expedition can be used effectively to plot the details of Parry's itinerary over the most critical part of the journey.

Probably the most important are the Parry notebooks, preserved in the Iowa State College Library, Ames, Iowa. A notebook for 1867, pp. 21–39, headed "Route from Fort Wallace to Fort Lyon on the Arkansas" records meteorological data taken along the course of the journey; dates and place names are linked and thus are of value in piecing together the exact route. Most of the localities mentioned may be found on the Huerfano Park Reconnaissance Map of 1892 (U. S. Geological Survey, 1892). The portion of this notebook pertaining to the plant collections made in the 'Huerfano Mountains' is abstracted below:

July, 13. Old Fort Lyon; 22. camp 10 mi. above Fort Lyon; 25. Timpas Creek near mouth; 26, 27. camp 5 mi. above mouth of Apishapa; 27. Apishapa Crossing. ranch 8 miles below mouth of Huerfano; 30. Wilton's Ranch on Huerfano 10 miles above mouth. Doyle's Ranch; 31. Craigs, bottom of Huerfano.

August, 1, 2. bottom of Huerfano; 2, 3. Corral de Toro; 4. camp at foot of Sierra Mojada [Wet Mountains]. Greenhorn Ridge, highest point reached; 5. two miles above mouth of Apache Creek. Patterson's Ranch. on Huerfano bottom; 6. two miles above Butte [presumably the Little Huerfano, a prominent volcanic plug in the plain at the mouth of the Huerfano]; Badito Ranch. foot of mountains; 7, 8. foot of mountains; camp 6 miles above Badito; 9. going to Sangre de Cristo Pass, 9 miles below; 10, 11. camp 6 miles above Badito; 11. camp 6 miles east of Pass; 12. oak grove 10 ft. above creek; 12–18. Sangre de Cristo Pass, on a bench below the crest; 19. survey station, Huerfano Valley; 27–29. Huerfano Valley below La Marsca [Mosca] Pass; 31. camp 1 mi. E. of Sangre de Cristo Pass; 31–Sept. 3. camp in Sangre de Cristo Valley 2 miles west of Pass.

Sept. 3–4. camp below Placer Creek; 4, 5. camp 3 miles above Fort Garland. (The journal ends here).

The mission of Parry's group along this route, as will be seen from some quotations to follow, was to investigate the feasibility of a railroad route through the Sangre de Cristo Pass. For this reason a great amount of time was spent in the Huerfano Creek drainage, and it was here that the bulk of the Parry plant collections were made. The available evidence implies that the rest of the journey, from Sangre de Cristo Pass to Fort Garland and on to Santa Fe, was a rapid one, which did not permit a leisurely study of the vegetation.

Other valuable tools for interpreting the 1867 collections are the narrative by Bell (1870) and the official report on the expedition by General Palmer (Palmer 1869). The Bell narrative contains,

as an appendix, the list of plants collected by Parry, together with their general localities ('Colorado', 'Fort Garland', 'Valley of the Huerfano', 'Sangre de Cristo' [Pass], 'Purgatoire Valley', 'Sierra Blanca', 'Greenhorn Mountains', 'Upper Huerfano', and 'Upper Arkansas'), but Parry implies slight errors, for he claimed (Parry 1878) that the list was printed without his having opportunity to revise it. As might be expected, '*Cynomarathrum saxatile* Nutt. in herb. Durand', the specimen subsequently described as *Neoparrya lithophila*, is listed as having been collected near 'Sangre de Cristo' [Pass].

Despite the fact that Parry's plant list as published in Bell (1870) reports many specimens from Colorado, Porter and Coulter (1874) in their Synopsis of the Flora of Colorado, do not cite any of Parry's 1867 collections. Either they did not see these specimens or believed them to have been collected, as the labels may have indicated, in New Mexico.

General Palmer's official report (Palmer, 1869) described the 'Huerfano Route' as follows:

"This was instrumentally examined by Mr. J. Imbrie Miller, Division Engineer, under direction of General Wright. It deflects from the Raton Mountain Line at Fort Lyon, and follows up the Valley of the Arkansas and its tributary—the Huerfano—to the summit of the 'Spanish Range' at the Sangre de Christo Pass, 141 miles from Fort Lyon—thence 50 miles southwestwardly to the Rio Grande, which it intersects near the mouth of the Culebro, at a point about 33 miles below Fort Garland, and thence down the Rio Grande to Albuquerque. The instrumental examination terminated on reaching the Rio Grande, where the elevation was found to be 7301 feet above tide—that at the summit of Sangre de Christo Pass being 9186 feet.

The 'Mosca Pass' was also surveyed by Mr. Miller, but he reports both that and the Sangre de Christo to be impracticable within the Congressional limit of grade (116 ft. per mile), and there is the additional objection of heavy winter snows."

Bell mentions the Huerfano route, and Parry's part in the work, briefly in the following excerpt (Bell, 1870):

"Early on the morning of the third day after our arrival in Santa Fe [Sept. 16], two of our friends came into the fonda—Calhoun and Imbrey Millar,—whom we parted with at Fort Lyon; and before evening all Millar's party arrived safe and sound, but much travel-stained and almost shoeless, from their mountain explorations. After leaving us at Fort Lyon, they had followed up the Arkansas and its tributary, the Huerfano, through the Sangre de Christo Pass to Fort Garland, a mili-

tary post in the centre of the Rocky Mountains of Colorado; and after examining some of the most favorable passes which lead from the heads of the Huerfano to the sources of the Rio Grande [Mosca Pass], they followed the latter stream for 200 miles down to Santa Fé." (pp. 148–149). . . . "On the Huerfano Route, Dr. Parry reports that he met with no workable coal" (page 114).

Judging from these several complementary source materials, it was abundantly clear that the Huerfano Mountains of Parry were not in New Mexico at all, but in Colorado; all that remained, then, for a successful solution to the problem of the lost *Neoparrya*, was a visit to the Sangre de Cristo Pass and the valley of the Huerfano, which rises just east of the Pass.

The actual story of the rediscovery is anticlimactic, for the area was accessible, the habitat was indicated, the weather cooperative and the season right. Sangre de Cristo Pass was quickly eliminated from consideration, being an overgrazed saddle in the upper montane aspen zone with no promising rock outcrops. More promising was the eastern approach to the pass along a gravel road which follows the base of some huge rock walls and taluses in the form of dikes radiating out from a prominent hill southeast of Sangre de Cristo Pass. A five-minute reconnaissance on the slope of one such dike was sufficient; *Neoparrya* was there in great abundance.[3]

As expected, *Neoparrya lithophila* bears a strong resemblance to *Aletes acaulis* in its caespitose habit and masses of stiff basal leaves, yellow flowers and rounded inflorescence with reflexed outer rays. Like *Aletes*, it occurs in crevices of rock outcrops with little soil, but despite its north exposure, the slope on which the plants grow is more arid than those customarily inhabited by *Aletes acaulis*, rather more like that of *A. macdougalii*. Associates of *Neoparrya* include *Pinus edulis*, *Leptodactylon pungens* *Hymenoxys richardsonii* and *Gutierrezia sarothrae*. The yellow flowers, in late June, were already almost gone, an indication of how very late Parry's September collections were. Many mericarps were well developed, and thin sections verified the peculiar condition of the scattered oil tubes. Whether these

[3] COLORADO. HUERFANO CO.: forming large clumps up to two feet in diameter among rocks on stabilized talus of a dike radiating from Dike Mountain, valley of South Oak Creek, between Badito and Sangre de Cristo Pass, 2 miles south and 4 miles west of Badito, ca. 7,000 ft. alt., 105°05′ W. Long., 37°41′ N. Lat. (Huerfano Park Sheet, Reconnaissance Map, U.S.G.S. ed. 1892), 29 June 1957, *W. A. Weber & Laurent Gaudreau 10,571*.

alone can maintain *Neoparrya* on the generic level, however, is a question which the writer does not feel ready at this time to resolve. Suffice it to say that the general morphology, phytogeography, phenology, and ecological preference suggest an extremely close relationship with the three species of *Aletes*.

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THREE NEW ANNUAL SUNFLOWERS (HELIANTHUS) FROM THE SOUTHWESTERN UNITED STATES

Charles B. Heiser, Jr.[1]

I. A NEW AND POSSIBLY EXTINCT SUNFLOWER FROM TEXAS

Helianthus paradoxus, sp. nov. Herba annua, 15 dm. alta, caule sparse scabra, foliis oppositis supra, alternis infra, laminiis inferioribus lanceolatis basi cuneatis, 10 cm. longis, 2.5 cm. latis, profunde 3-nervis, integris, scabris, petiolis 2 cm. longis, pedunculis 3–5, 12–18 cm. longis, phyllariis 16–20, ovato-lanceolatis vel lanceolatis, sparse hispidis, 10 mm. longis, 3 mm. latis, disco ca. 1.8 cm. diam., radiis ca. 15, 1.7 cm. longis, 0.7 cm. latis, corollis disci purpureis, paleis receptaculi ad apicem glabris. TEXAS: Pecos Co., 7 mi. west of Ft. Stockton, Sept. 11, 1947, *H. R. Reed* (type, US; isotypes, GH, SMU).

The new species appears to be most closely related to *H. petiolaris* and *H. annuus.* Its most distinctive feature is the strongly 3-nerved lanceolate leaves. The multicellular bases of the hairs on the upper surface of the leaf give it a distinct punctate appearance. In addition to the leaf shape, the new species is readily distinguished from *H. annuus* by the smaller heads, the nearly glabrous stem, and the narrower phyllaries, and from *H. petiolaris* by the glabrous chaff. The tap root is poorly developed and its similarity to that of *H. agrestis,* a species of low wet places, suggests that it may be a paludose species.

I have waited several years to describe this species in hopes of obtaining additional material. In 1955 an intensive search was made for this plant in the area around Ft. Stockton. Seven miles west of town presumably where the type was collected, there is a low marshy area which I visited in August. Although it may have been too early for the species to be in flower, I found nothing resembling this species in vegetative condition. The area was almost completely covered with the dead stalks of another *Helianthus,* however. A few seeds were secured from dried heads and all of them gave rise to plants of *H. annuus.* In 1957 Dr. Raymond Jackson visited this area and also found no sunflowers other than *H. annuus.*

Two other specimens (*Baker 2,* GH, TEX) have been seen from Fort Stockton which are rather puzzling. These plants

[1] This study was aided by a grant from the National Science Foundation.

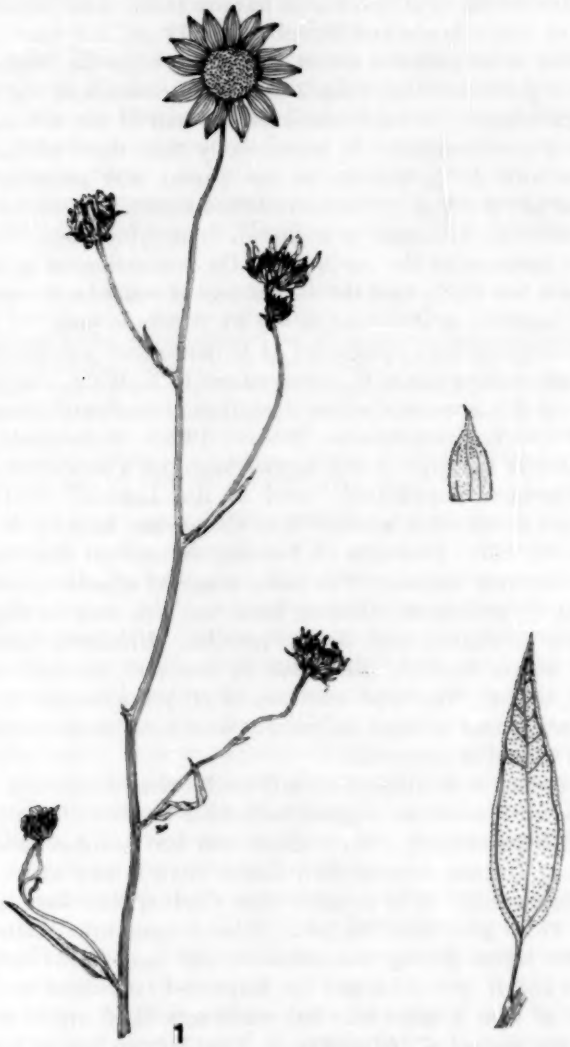

FIG. 1. *Helianthus paradoxus*. Branch and leaf, x ½; phyllary, x 1½. Drawing by Ruth Smith.

are rather similar to *H. paradoxus* but are taller, much branched and have larger heads and leaves (blade 13 cm. x 5 cm.) Examination of the pollen in several flowers revealed the number of stainable grains to range from 2 to 37% in contrast to the 98% of *H. paradoxus*. In addition, over one half of the achenes in the head were unfilled. It seems likely that these plants are hybrids with *H. paradoxus* as one parent and probably *H. neglectus* as the other. The latter is not known to occur in this area, however, although it is known from Monahans, Texas, a short distance to the northwest. On morphological grounds it appears less likely that the second parent could be *H. annuus* which, however, is abundant in the Ft. Stockton area.

The specimen here designated as *H. paradoxus* was identified by me some years ago as *H. praetermissus* E. E. Wats., chiefly on the basis of a specimen which I at that time thought was an isotype of *H. praetermissus* (Heiser, 1952). Subsequent examination of the type of this species based on a collection from the Sitgreaves Expedition, "head of Rio Laguna" Sept. 27, 1851, and a collection labeled "Nay Camp, Rio Laguna, N. M., August 26, 1851" (Valencia Co.) convinced me that they belong to two different species. The latter material appears to be the same as *H. paradoxus*, differing from the type only in slightly narrower phyllaries and longer petioles. *Helianthus praetermissus* differs from *H. paradoxus* by its very narrow, sessile hirsute leaves. The type specimen of *H. praetermissus* is very fragmentary and no roots are present so it is not known whether it is an annual or perennial.

No specimens of either of these New Mexican sunflowers have been secured since the original collection in 1851. It may be that both are extinct. Río Laguna, now Río San José, and the pueblo of Laguna derived their names from a lake which now has disappeared. It is possible that these species were marsh plants which grew near the lake. I have made brief excursions into this region during two summers and have found only *H. annuus* and *H. petiolaris*, and Dr. Raymond Jackson of the University of New Mexico who has made special efforts to collect all of the species of *Helianthus* of New Mexico has so far not encountered either *H. paradoxus* or *H. praetermissus*.

II. DESCRIPTION AND CYTOGENETICS OF A SECOND NEW SUNFLOWER FROM TEXAS

In 1950 Theodore Odell in a search for *Helianthus paradoxus* for me brought back seeds of a sunflower from near Monahans, Texas. It was clearly evident that the plants grown from these seeds represented a new sunflower obviously closely related to *H. petiolaris* Nutt. In 1955 I was able to visit this area and I found these sunflowers growing in scattered colonies along Highway 80, ten miles east of Monahans to within two miles of the city.

Helianthus neglectus, sp. nov. Herba annua, 8–15 dm. alta, caule dense hispido infra, ramoso supra, foliis inferioribus ovatis, plerumque cordatis ad basim, subintegris vel serrulatis remote, sparse hispidis, pilis propiter appressis, laminis 7–14 cm. longis, 7.5–12.3 cm. latis, petiolis 9–11 mm. longis, pedunculis 10–40 cm. longis, phyllariis 25–35, lanceolatis, attenuatis 15–24 mm. longis, 2.5–4.0 cm. latis, disco ca. 2.3–2.8 cm. in diam., radiis 21–31, 3.0–3.9 cm. longis, 1.0–1.4 cm. latis, palei centrale receptaculi ad apicem albo-hirsutis. TEXAS: Ector Co., 10 miles east of Monahans, July 22, 1955, *Heiser 4123* (type, IND).

It seems somewhat arbitrary whether this sunflower is treated as a species or as a subspecies of *H. petiolaris*. It does not intergrade with the latter, but it is closely related as can be seen from the densely white pubescent chaff tips in the center of the head and most of the other characteristics. It differs from it, however, in the very long attenuate phyllaries, the larger heads, the broader, and frequently, cordate leaves, the densely hispid-hirsute lower stems, and the fact that the branches come off at a greater angle. The two species are allopatric, with *H. petiolaris* having a wide distribution over the western half of North America, and extending within 60 miles of *H. neglectus* in Martin Co., Texas. The new species grows in a more xerophytic area than does *H. petiolaris* in the Texas area.

The cordate leaf of *H. neglectus* is similar to that of certain races of *H. annuus* and *H. debilis*. *Helianthus debilis* occurs in eastern Texas and *H. annuus* is common throughout Texas, but no plants of these two species were seen growing in the area of *H. neglectus*. That *H. neglectus* owes its origin to past hybridization between *H. annuus* and *H. petiolaris* is a possibility, but it appears more probable that the new species differentiated from the same gene pool as *H. petiolaris*. The angle of branching in

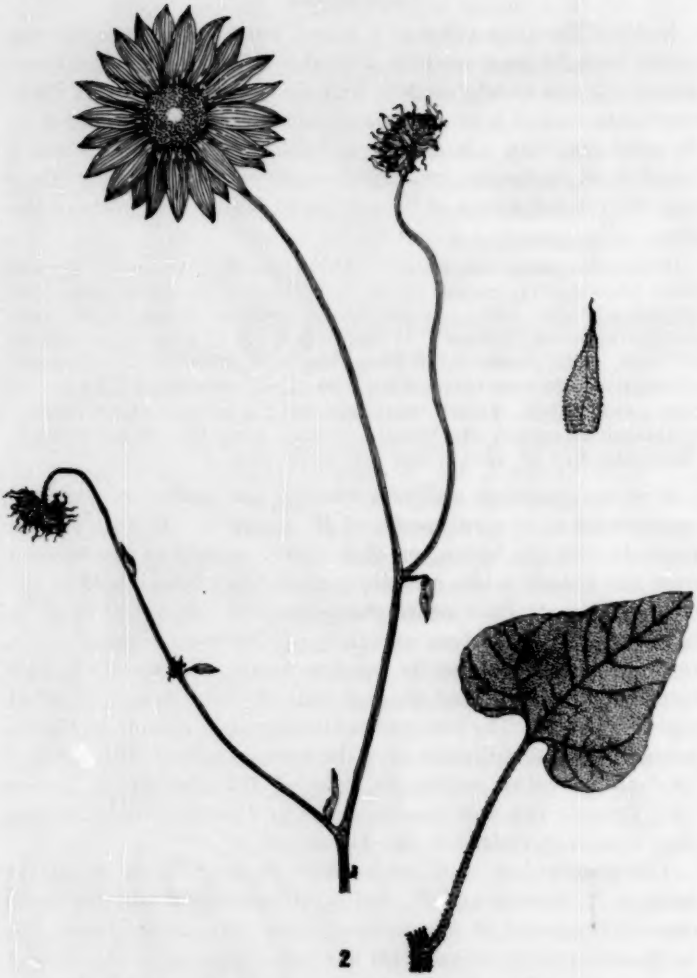

Fig. 2. *Helianthus neglectus*. Branch and leaf, x ½; phyllary, x 1½.

H. neglectus is unique and is most nearly approached by that of *H. paradoxus* of Pecos County, Texas.

The new species has been crossed with *H. annuus* and with two or more races of both *H. petiolaris* and *H. debilis*. The hybrids (Table 1), generally ten plants of each combination except in *5783b* where only one hybrid plant was secured, were grown in the experimental garden at Bloomington. Pollen grains for several plants in each culture were stained in cotton blue and those taking a deep stain were counted as "good". Seed set was estimated by examining the number of filled achenes in several heads in each plant and in general, the percentage of filled achenes was about of the same order as the percentage of "good" pollen. All of the species included in the hybridization program are diploid (n = 17). Aceto-carmine smears of the pollen mother cells from one plant of each of the hybrids were made and chromosome pairing was examined at diakenesis. Crosses of sister plants of all the species were made and were found to give fertile progeny with the expected 17 pairs of chromosomes. The results of the cytological survey are given in Table 1.

HYBRIDS WITH H. PETIOLARIS.—*Helianthus petiolaris* comprises two cytogenetic races: race A from the central and western United States and race B from the southwestern United States (Heiser, unpubl.). Crosses of *H. neglectus* with both races give F_1 hybrids with varying degrees of sterility and from the examination of meiosis it is clear that they both differ from *H. neglectus* by at least one translocation. The hybrids involving race B generally show higher pollen fertilities although a few cells in these hybrids showed the presence of two chains of four which would imply a difference of two translocations.

The single hybrid secured with *H. petiolaris* var. *canescens*, a taxon found from southwestern Texas through southern Arizona to northern Mexico, shows even greater sterility and indicates considerable structural differences in the chromosomes of the two parents.

HYBRIDS WITH H. ANNUUS.—Ten plants of the hybrid, *H. neglectus* x *annuus* were grown with *H. neglectus* as the female parent. The reciprocal cross failed. Pollen fertility was quite low and some heads failed to produce a single filled achene.

TABLE I. POLLEN FERTILITY AND CHROMOSOME PAIRING IN F_1 HYBRIDS OF *H. neglectus* WITH OTHER SPECIES

Culture Number	*H. neglectus* ×	Range of Stainable Pollen	No. of Plants Examined for Pollen	No. of Cells at Diakinesis with: 17 II	15 II ⊙4	15 II IV*	14 II VI	13 II IV IV	12 II IV VI	11 II VI VI
5781	*petiolaris* A Gary, Ind.	43, 44%	2	15		15				
5627a	*petiolaris* A St. Louis, Mo.	22–28%	3	1	17	2				
5627b	reciprocal	14–35%	5	4	3	16				
5247a	*petiolaris* B Amarillo, Tex.	28–39%	3	10	16	11		2?		
5782	*petiolaris* B Shamrock, Tex.	35, 37%	2	3		12		2?		
5626b	*petiolaris* B Acoma 1, N. M.	49–79%	4	3	3	12				
54–46:42	reciprocal	55–80%	6	1		7		2		
5561a	*petiolaris* B	24%	1							
	Acoma 2, N. M.	27–77%	6	4		6				
5783b	*petiolaris* var. *canescens* Dona Ana Co. N.M.	9%	1						1	5
5248a	*annuus* St. Louis, Mo.	2, 3%	2							
5420a	*debilis* ssp. *cucumerifolius* Gonzales, Tex.	12–21%	7			1	2	3	1	2
5420b	reciprocal	16–21%	8							
5526a	*debilis* ssp. *praecox* Galveston, Tex.	60–81%	3	4		10	9	2		
5526b	reciprocal	46–68%	3	4		10	9	2		

* Occasional cells with 15 II III I have been lumped with the 15 II IV category for convenience.

Meiosis was examined in one plant but the configurations could not be determined with certainty although it was apparent that one or more chains were present. These hybrids, in general, are rather similar to those of *H. annuus* x *petiolaris*.

HYBRIDS WITH H. DEBILIS.—*Helianthus debilis* has been shown to comprise two cytogenetic races (Heiser, 1956). Representatives of one group of subspecies, including *H. debilis* subsp. *praecox*, when crossed with *H. neglectus* give F_1 hybrids with higher fertilities than does the second group, which includes *H. debilis* subsp. *cucumerifolius*. Similar results are secured in crosses of *H. petiolaris* with these subspecies.

III. A NEW SUBSPECIES OF H. PETIOLARIS

Recent field work combined with garden and herbarium studies has convinced me that the southwestern representatives of *H. petiolaris* are quite different from the typical element of the species. Crosses of the new subspecies have been made with several races of *H. petiolaris* subsp. *petiolaris* and it has been found that some of the resulting hybrids are fertile whereas others show some sterility. It seems desirable to put the subspecies on record at the present time, although a detailed discussion of the variation and cytogenetics will be deferred until later.

H. petiolaris subsp. **fallax**, subsp. nov. Herba annua, 0.5–2.0 m. alta, caule hispido vel glabro raro, rubro vel viride, ramoso supra; foliis inferioribus lanceolatis vel deltoideolanceolatis, serratis vel integris, 6–15 cm. longis, 1–6 cm. latis; pedunculis 5–40 cm. longis, phyllariis 12–20 mm. longis, 3–4 mm. latis, plerumque hispidis, glabris vel hirsutis raro, columnis antheris rubris vel purpureis.

Distribution:[2] western Colorado to Utah south to New Mexico and Arizona, 4000 to 8000'; June to Sept. ARIZONA: Apache Co., Painted Desert, July 25, 1955. *Heiser 4149* (Type, IND); Coconino Co., *Eastwood and Howell 6925* (US); Cochise Co., *Blumer 1488* (NY); Gila Co., *Harrison and Kearney 8294* (US); Pima Co., *Chondhri 60* (IND); Navajo Co., *Heiser 4164* (IND); Yavapai Co., *Peebles* et al *4291* (US). COLORADO: Moffat Co., *Heiser 4540* (IND); Montrose Co., *Walker 152* (GH, US). NEW MEXICO: Bernalillo Co., *Jackson 2101* (UNM); Chaves Co., *Griffiths 5685* (US); Colfax Co., *Heiser 4171a* (IND); Dona Ana Co., *Dunn 5350* (UNM); Eddy Co., *Whitehouse 16809* (US); Grant Co., *Metcalfe 763* (GH, NO, NY, US); Quay Co., *Fisher 35* (US); Rio Arriba Co., *Jackson 744* (UNM); San Juan Co., *Jackson 2485-2* (UNM); San Miguel Co., *Standley 5041* (MO, NY);

[2] One specimen from each county is cited. The herbarium abbreviations used are those recommended in *Index Herbariorum*. I would like to express my thanks to the curators of the herbaria cited for making the specimens available for study.

Fig. 3. *Helianthus petiolaris* subsp. *fallax*. Branch and leaf, x ½; phyllary, x 1½.

FIG. 4. *Helianthus petiolaris* subsp. *petiolaris*. Branch and leaf, ×⅛; phyllary, ×½.

Sante Fe Co., *Heller 3785* (MO, NY, US); Socorro Co., *Dunn 5090* (UNM); Torrance Co., *Heiser 4509* (IND); Valencia Co., *Weatherwax* (IND). UTAH: Emory Co., *Stoutamire 2602* (IND); Garfield Co., *Piranian* (UTC); Grand Co., *Holmgren and Hansen 3288* (GH, NY); Kane Co., *Heiser 4512* (IND); San Juan Co., *Heiser 4154* (IND); Uintah Co., *Rollins 1725* (GH, MO, NY); Utah Co., *Jones 509* (GH); Washington Co., *Jones 5257* (MO, US); Wayne Co., *Stoutamire 2592* (IND).

Helianthus petiolaris subsp. *petiolaris*[3] which is found from Wisconsin to British Columbia, south to Texas, and occasionally adventive elsewhere, is from 0.5 to 1.4 mm. tall, more branched and spreading with stems usually green, rarely red, strigose, or somewhat hispid near base, lower leaves usually oblong lanceolate to deltoid-lanceolate, usually not over 12 cm. long by 6 cm. wide, peduncles shorter, phyllaries ovate-lanceolate to lanceolate, 10–14 cm. long, 3.5–5.5 mm. broad, strigose, and anthers usually purple, rarely red.

The new subspecies is extremely variable as can be seen from the description. From garden cultivation it is apparent that some of the variation in nature must be environmental modification of the phenotype although a great deal of genetic variability is also present. In the eastern part of its range it grades into *H. petiolaris* subsp. *petiolaris* and in the south into *H. petiolaris* var. *canescens* A. Gray. In its extreme form it is, however, very distinct and if it were not for the presence of intermediates I would consider it a distinct species. The generally longer, narrower phyllaries and the hirsute stem are perhaps the most reliable characters to separate it from *H. petiolaris* subsp. *petiolaris*; from *H. petiolaris* var. *canescens* it is most readily distinguished by a hispid rather than a canescent pubescence.

Summary

Two new species and one new subspecies of *Helianthus* are described: *H. paradoxus* from Pecos Co., Texas and Valencia Co., N. M.; *H. neglectus* known only from Ector Co., Texas; and *H. petiolaris* subsp. *fallax* from Colorado, Utah, New Mexico and

[3] Nuttall (p. 115. 1821) gives "on the sandy shores of the Arkansa" as the type locality. Watson (1929) cites a collection by Nuttall from the "Upper Missouri River" in the Academy of Natural Science at Philadelphia as the type. I have examined this specimen and also a photograph of a Nuttall specimen from the British Museum labeled "Arkansa" and the latter certainly must be regarded as the type. It is clear from Nuttall's account in his Journal, however, that the specimen was collected in what is now northeastern Oklahoma.

Arizona. Artificial hybrids of *H. neglectus* with several other species are discussed.—DEPARTMENT OF BOTANY, INDIANA UNIVERSITY, BLOOMINGTON, IND.

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DESCRIPTION, DISTRIBUTION AND ECOLOGY OF THREE SPECIES OF VAUCHERIA PREVIOUSLY UNKNOWN FROM NORTH AMERICA

JOHN L. BLUM AND ROBERT T. WILCE

During the period from June to November, 1955, a survey was made of the distribution and ecology of attached marine algae along the coast of the Labrador peninsula. Collections were made from the mouth of the Koksoak River, Quebec, northward along the western side of the Labrador peninsula to Port Harvey, Killinek Is., Quebec, and in a less extensive area in the regions of Hebron and Saglek, Labrador. Collected materials from the mouth of the Koksoak River and False River Bay, Quebec, show three species of Vaucheria previously unknown from North America.[1]

The writers express their gratitude to Dr. I. Mackenzie Lamb, Director of the Farlow Library and Herbarium, Harvard University, for the loan of the type material of *Vaucheria compacta* (Collins) Collins, and to Dr. David Irvine, who provided preserved material of *V. sphaerospora* Nordstedt collected in Scotland.

Intertidal areas of southeastern and southwestern Ungava Bay, especially at the heads of fjords and bays and near the mouths of larger rivers and streams, take the form of broad,

[1] Specimens of the described species have been deposited in the New York Botanical Garden and the herbarium of the University of Michigan.

expansive, boulder-strewn mud flats as a result of enormously high tides, the low relief of the surrounding watershed, and the tremendous discharge of silt from rivers and other streams. In such habitats, uncommon in the area investigated, silty mud covers much of the shore between tides and, in regions of quiet water, extends well into the sublittoral. A dense, wide-spreading carpet or mat of Vaucheria filaments is common on these mud flats. Frequently, colonies of these plants are continuous for several square meters or more in extent, penetrating the silt and grit only slightly, but becoming strongly infiltrated with it so that the mat assumes considerable firmness. The overall appearance of the mat is dark green, becoming a glistening black when covered with water, and at that time, extremely slippery.

At the two stations[2] where these plants were seen the colonies were so located that at low water level, in most instances, all of the mat would be exposed for varying periods of time. In the most sheltered regions, where the water is continually quiet, small patches of the mat may extend into the upper sublittoral. The latter patches are subject to exposure only during low spring tides.

In addition to the Vaucheria species, a few other marine algae are present in this community, but are far less conspicuous. Among these are *Gloeocystis scopulorum* Hansgirg, *Urococcus foslieanus* Hansgirg and *Calothrix scopulorum* Drouet and Daily.

Vaucheria sphaerospora Nordstedt (fig. 1, 2). This well known European species, fruiting abundantly, was collected in quantity. It was apparently the dominant element of the mat. The measurements of the Quebec material correspond well with those given by Nordstedt (1878) in his description of this species. *V. sphaerospora* is distinctive in possessing a special fruiting branch which bears an oogonium and a single antheridium which curves toward the oogonium. This species is the only Piloboloidean Vaucheria possessing this combination of characters.

The oogonium is formed from the fruiting branch immediately below the suffultory cell which subtends the antheridium, much as in *V. intermedia* Nordstedt and *V. minuta* Blum and Conover. As the cylindrical oogonial filament becomes laterally distended

[2] *Wilce 830*, September 1, 1955, near the mouth of the Koksoak River, eastern shore; *Wilce 844*, September 4, 1955, toward the head of False River Bay on the western side.

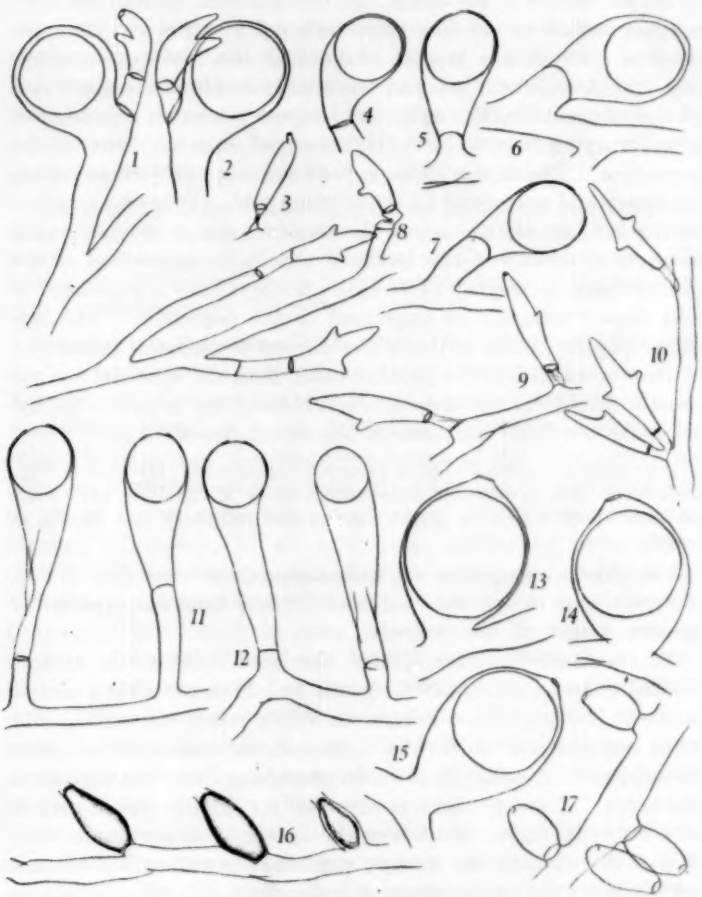

FIG. 1–17 VAUCHERIA. Fig. 1 & 2 *Vaucheria sphaerospora*. Fig. 3–8 *V. compacta*; fig. 3–5 drawn from type material in the Farlow Herbarium of Harvard University; Mystic River marshes, Malden, Mass., Sept. 1897 (*F. S. Collins 477*); fig. 3 Antheridium; fig. 4 & 5 Oogonia; fig. 6–8 drawn from material collected in Great Pond, Falmouth, Mass. (*J. T. Conover, 53–6*); fig. 6 & 7 Oogonia; fig. 8 Antheridium. Fig. 9–12 *V. compacta var. hoksoakensis*; fig. 9 & 10 Antheridia; fig. 11–12 Oogonia. Fig. 13–17 *V. submarina*; fig. 13–15 Oogonia; fig. 16 & 17 Antheridia. All figures about 90X.

in the formation of the oogonium, the antheridium and the subtending suffultory cell lose their terminal position and thus appear to constitute a lateral offshoot of the mature oogonium (fig. 2). A wide terminal pore eventually forms at the upper end of the oogonium. The spherical oospore possesses at maturity a wall varying from 1–4μ in thickness and does not quite fill the oogonium. The antheridium is fusiform or conical at maturity, its upper end narrowing to its terminal pore. Other pores, numbering 1–4, are at the ends of the papillae, one or more of which may equal or exceed the terminal papilla or upper end of the antheridium in length. The entire antheridium lies parallel to and closely adjacent or appressed to the oogonium. The terminal papilla of the antheridium curves toward the upper end of the oogonium and the papillae other than the terminal one are mostly found on the side of the antheridium adjacent to the oogonial pore, and are more or less directed toward it.

Vegetative filaments 28–53μ in diameter; oogonium 87–178 × 214–386μ; oospore 86–144μ in diameter; antheridium 38–57 × 128–157μ; antheridial papillae 14–33 (–45)μ in length; antheridial suffultory cell 50–57μ in length.

Vaucheria compacta *var.* **koksoakensis** *var. nov.* (fig. 9–12). A typo differt in oogonia longiora. Differs from the type in the greater length of the oogonia.

V. compacta (Collins) Collins has been collected in eastern United States (Collins 1900, Blum and Conover 1953), and in western Europe (*vide* Christensen 1952). It is dioecious, with both oogonia and antheridia borne at the ends of short erect branches which occur in short series arising from the vegetative filaments. The oogonium is essentially cylindric but is greatly swollen at its upper end where the spherical oospore is present. Below the oospore the mature oogonium is empty. The stalk which bears the antheridium occasionally sends out a branch, in such a way that the antheridial branch bears two antheridia (fig. 10). Antheridia dehisce by two or three pores which terminate conical papillae, one of which is always terminal.

In the type material of *V. compacta* (fig. 3–5), and in the material of *V. compacta* from Massachusetts (*J. T. Conover 53–6*, east shore marsh, Great Pond, Falmouth, Barnstable Co., Jan. 31, 1953, fig. 6–8), the length of the oogonium averages 1.5–2.5

× the length of the oospore (fig. 4–7). In the material of *V. compacta var. koksoakensis* the oogonium is much longer, averaging from 3–4 × the length of the oospore (fig. 11–12); thus its appearance is significantly different from that of the type. Although this difference could be due to environmental factors, on the basis of the available data it seems nevertheless preferable not to regard this material as typical *V. compacta*.

Measurements of the Quebec material are as follows: Vegetative filaments 21–50μ in diameter; oogonium 87–128 × 235–357μ; oospore 92–100 (–114)μ; antheridium 24–48 × 128–186μ; papilla of antheridium 8–27μ in length; suffultory cell 28–65μ in length; total length of the oogonium with its subtending stalk 214–429μ.

Vaucheria submarina Berk. *sensu* De Wildeman 1899 (fig. 13–17). Adequate knowledge of the widespread *V. dichotoma*. Ag. and of its forms or varieties, if any, awaits further study. *V. submarina* is certainly closely related to *V. dichotoma* and may be referable to one of the described forms of the latter, such as Hauck's *V. dichotoma f. marina*, although the brief original description of the latter form renders the name essentially ambiguous. Berkeley, in an even less satisfactory description than Hauck's, raised *V. dichotoma f. marina* to specific rank, *V. submarina* Berk. De Wildeman, in his *Algues de la Flore de Buitenzorg* (1900) used the name *V. submarina* Berk. in a precise way, and from De Wildeman's description it is possible to identify *V. submarina* as one of the species from the Quebec collections. These plants seem to correspond in all essential respects with the material collected by De Wildeman in Java. Our material was found as a sparse admixture in the *V. sphaerospora* stratum.

This species, like *V. dichotoma*, is apparently dioecious, the subspherical oogonia being borne singly (in our material) on a short stalk directly upon the horizontal vegetative filaments, and the bottle-shaped, fusiform or cylindric antheridia being borne in uni- or multilateral series, on filaments separate from those which bear oogonia. Our material is strikingly smaller than *V. dichotoma* in the size of the vegetative filaments, and is further unlike that species in the spherical shape of the oospore, which fills a relatively smaller portion of the oogonium. In *V. dichotoma* the entire oogonium is usually filled by the oospore.

Vegetative filaments (35–) 50–84 (–100)μ in diameter; oogonium 185–228 × 186–314μ; oogonial pore about 12–40μ in diameter; oospore (130–) 171–186 × (150–) 171–200μ; antheridia 43–71 × 114–200μ.

Summary

Collections of tidal Vaucheriae gathered in the Ungava Bay region of northern Quebec are described and brief notes on their habitat are given. *Vaucheria sphaerospora* and *V. submarina* are considered to be new to the North American flora. A collection of *V. compacta* characterized by unusually long oogonia is described as *V. compacta var. koksoakensis*.—CANISIUS COLLEGE, BUFFALO, N. Y. AND DEPARTMENT OF BOTANY, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN.

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